INTEX-NA Flight 16: 6 August 2004

Flight 16 was the 8th DC-8 science flight from Pease. The flight had three main objectives: (1) observe the eastern U.S. outflow to the Atlantic, including some WCB lifting, (2) survey the continental boundary layer across the Midwest to observe individual pollution plumes with a clean northerly background, and (3) validate the Terra satellite over the Walker Branch AERONET site in eastern Tennessee. Takeoff was at 1200 UT with a total flight duration of 9.5 hours. The flight plan and flight profile is shown in the attached slides.

The weather over the flight track was relatively tranquil. At the surface, weak low pressure was offshore of the Pease area, and a cold front extended southward from it toward the Florida Panhandle. The DC-8 appeared to descend into the post-frontal air during its low level runs near the East Coast. High pressure centered over western Illinois dominated most of the flight area, bringing fair weather to much of the region. This same flow pattern dominated the upper levels. The trough associated with the East Coast cyclone tilted westward with increasing altitude. This trough was quite sharp at the higher altitudes. At 300 mb, the trough stretched from central New York to central North Carolina. The DC-8 traversed the entrance region of the jet streak over the Carolinas. The deep trough also produced a low tropopause in its vicinity, causing the aircraft to sample stratospheric air. A high pressure ridge was located over the Midwest. Clouds were confined to the eastern portion of the flight region, near the surface front and its associated trough aloft.

The flight began with a climb to 33Kft heading south from Pease to observe the WCB outflow, and successfully sampled the outflow along a track (39.5N, 69W – 38N, 72.5W) in the altitude range 27-33K. This high-altitude outflow featured 130-140 ppb CO, 70-75 ppb ozone, 600 ppt CH3OOH, and low concentrations of soluble species (sulfate, nitric acid, H2O2) indicating highly scrubbed lifted air. Below 27Kft and down to 11Kft the composition was characteristic of background. We flew at low altitude along the east coast from New Jersey to South Carolina and observed the eastern U.S. outflow at 5-11Kft characterized by high CO (150 ppb),and SO2 (several ppb). Below 5K we sampled the local mixed layer and the air was typically cleaner. The 5-11K layer was remarkable as a very moist polluted layer clearly detached from the mixed layer. Heading NW from the South Carolina coast (32N, 80W) to our Terra spiral point (36N, 84.5W) we sampled mysterious thin black layers (visible from the aircraft) between 19 and 22Kft with CO as high as 200 ppb, ozone as high as 110 ppb, and elevated aerosol. These layers were not in any of the forecasts. They did not feature elevated nitriles. The Terra spiral (36N, 84W) was conducted under clear sky from 35K to 1K and intersected an enhanced CO layer (130-140 ppb) between 15K and 25K. The mixed layer was below 5K; it contained 150 ppb CO and 50 ppb ozone. From the spiral point and heading to our NW point (39.5N,90W) we sampled isolated pollution plumes in the mixed layer and again the mystery thin black layers at 17-22K. Our subsequent eastward transect from Illinois to Pennsylvania, mostly in the mixed layer, picked up a large number of apparently industrial plumes (high absorbing aerosol, SO_2 spikes, NO_2, but no CO). Our final climb to 35K over Massachusetts encountered the tropopause at only 28K and sampled deeply stratospheric air at 35K (400 ppb O3).

The navigational data are available at URL: http://www.dfrc.nasa.gov/Research/AirSci/DC-8/ICATS/index.html

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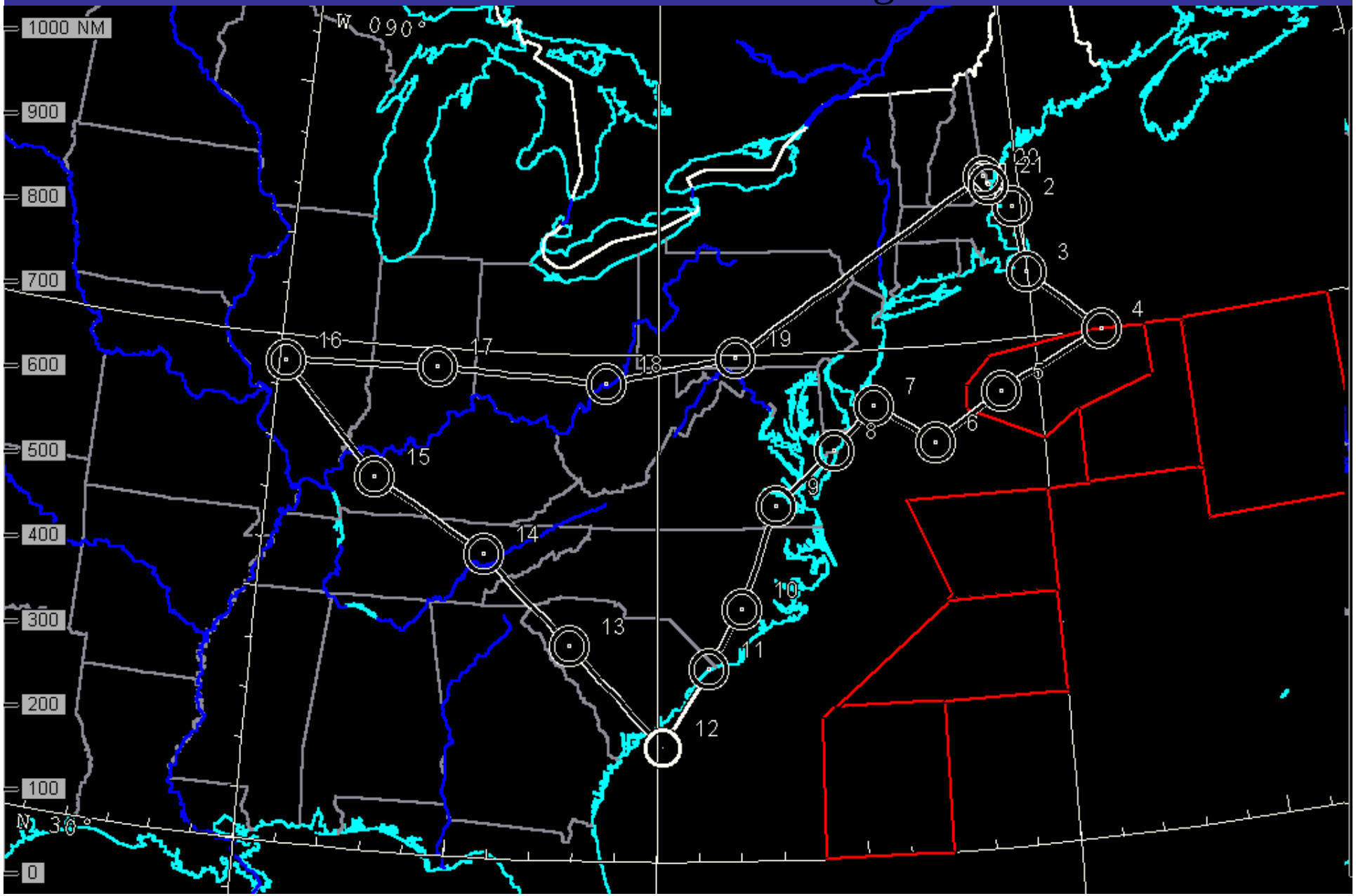

TYPE ACFT	CALL SIGN	DATE	FROM	TO	PLND TO	ACT TO	PILOT	COPILOT
DC-8	NASA817		PEASE INTL TR N 43 05.5 W070 50.0	PEASE INTL TR N 43 04.7 W070 49.4	12:06			

TOT DIST	TOT TIME	FUEL REQ	NAVIGATOR	ENGINEER
2642.7	08+38	89399		

TP DTD#	Fix/Point Description	FREQ	Latitude Longitude	Alt Wind	TAS GS	TC MC	LEG DIST DIST REM	LEG TIME TIME REM	ETA	RETA	ATA	REMARKS
1	KPSM 16/RW PEASE INTL TR		N 43 05.5 W070 50.0	94M		149 165	0.0 2643	00+00 08+38	12:06			
2 SCUPP	SCUPP/W SCUPP		N 42 36.2 W070 13.8	14485M	N/A N/A	138 154	39.6 2603	00+07 08+31	12:14			
3 ACK	ACK/E NANTUCKET	109X 116.20	N 41 16.9 W070 01.6	20000M	330 330	173 189	79.8 2523	00+15 08+17	12:28			
4 LACKS	LACKS/W LACKS		N 40 00.0 W068 12.0	20000M	330 330	133 149	113.5 2410	00+21 07+56	12:49			
5 39N71	.39N71W none		N 39 00.0 W071 00.0	20000M	330 330	245 261	143.2 2267	00+26 07+30	13:15			
6 AGUNE	AGUNE/W AGUNE		N 38 06.5 W072 50.0	20000M	330 330	230 252	101.5 2165	00+18 07+12	13:33			
7 FISSH	FISSH/W FISSH		N 38 53.5 W074 23.0	20000M	330 330	303 316	86.0 2078	00+16 06+56	13:49			
8 SWL	SWL/R SNOW HILL	071X 112.40	N 38 03.4 W075 27.8	20000M	330 330	225 238	71.4 2007	00+13 06+43	14:02			
9 FKN	FKN/R011017 FRANKLIN	043X 110.60	N 37 00.0 W077 00.0	20000M	330 330	229 240	96.9 1910	00+18 06+25	14:20			
10 ISO	ISO/R223028 KINSTON	033X 109.60	N 35 00.0 W077 55.0	20000M	330 330	200 210	127.9 1782	00+23 06+02	14:43			
11 CRE	CRE/R GRAND STRAND	123X 117.60	N 33 48.8 W078 43.5	20000M	330 330	209 218	81.6 1701	00+15 05+47	14:58			
12 CHS	CHS/R170038 CHARLESTON	082X 113.50	N 32 16.5 W079 50.9	20000M	330 330	212 219	108.2 1593	00+20 05+27	15:17			
13 GRD	GRD/R GREENWOOD	102X 115.50	N 34 15.1 W082 09.2	20000M	330 330	316 322	165.8 1427	00+30 04+57	15:48			
14 LIDAR	VXV/R287024 VOLUNTEER	111X 116.40	N 36 00.0 W084 22.0	20000M	330 330	314 319	151.1 1276	00+27 04+30	16:15			

TP	Fix/Point	FREQ	Latitude	Alt	TAS	TC	LEG DIST	LEG TIME	ETA	RETA	ATA	REMARKS

DTD#	Description		Longitude	Wind	GS	MC	DIST REM	TIME REM				
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15 OCT	OCT/R CENTRAL CITY	035X 109.80	N 37 22.9 W087 15.8	20000M	330 330	301 304	162.5 1113	00+30 03+30	17:15			
16 IJX	IJX/E129025 JACKSONVILLE	023X 108.60	N 39 30.0 W089 50.0	20000M	330 330	316 318	175.4 938	00+32 02+58	17:46			
17 SHB	SHB/R SHELBYVILLE	057X 112.00	N 39 38.0 W085 49.5	20000M	330 330	080 090	106.2 752	00+34 02+25	18:20			
18 JPU	JPU/R PARKERSBURG	023X 108.60	N 39 26.5 W081 22.5	20000M	330 330	093 099	206.8 545	00+38 01+47	18:58			
19 THS	THS/R ST THOMAS	097X 115.00	N 39 56.0 W077 57.1	20000M	330 330	079 089	161.3 383	00+29 01+18	19:27			
20 EPDEY	EPDEY/W EPDEY		N 43 14.5 W070 57.5	20000M	330 330	058 071	372.0 11	01+08 +10	20:35			
21	KPSM/A PEASE INTL TR		N 43 04.7 W070 49.4	100M		149 165	11.5 0	00+10 +00	20:45			

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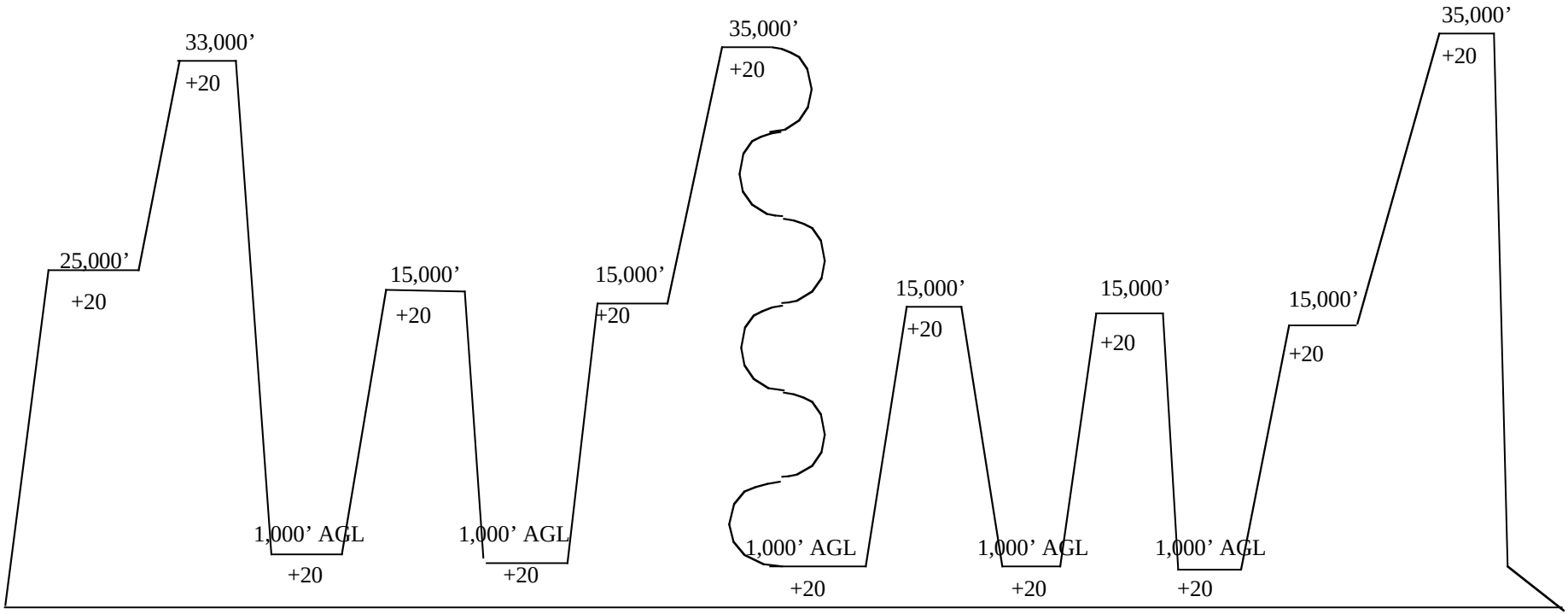
SPIRAL CLIMBS

to 10,000 msl @1,000 fpm

then 1500 fpm

ALL ENROUTE CLIMBS/DESCENTS

1500 FPM



INTEX-16 Flight plan- August 6, 2004

Point	Latitude	Longitude	Special instructions
1	43.1	-70.8	Estimated takeoff 8:00 am
2	39	-71	
3	37	-77	
4	32	-80	spiral under Terra satellite (overpass at 1230 local)
5	35.96	-84.29	
6	40	-90	
7	40	-78	
8	43.1	-70.8